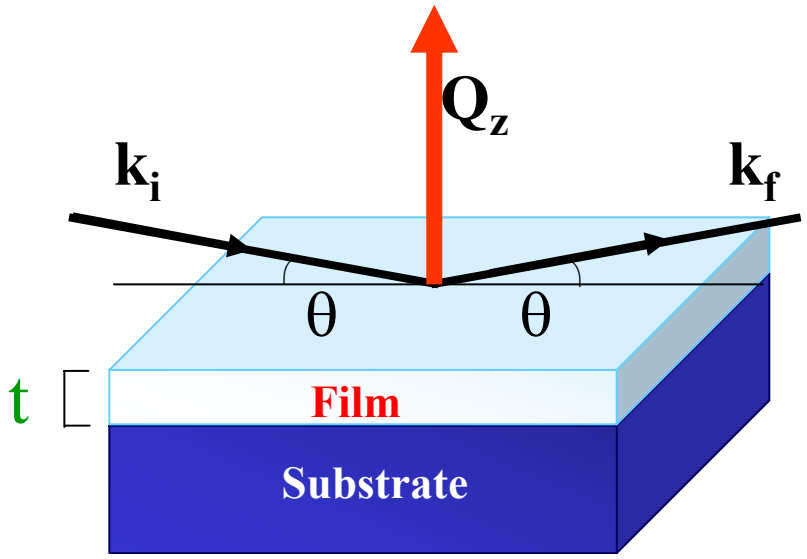
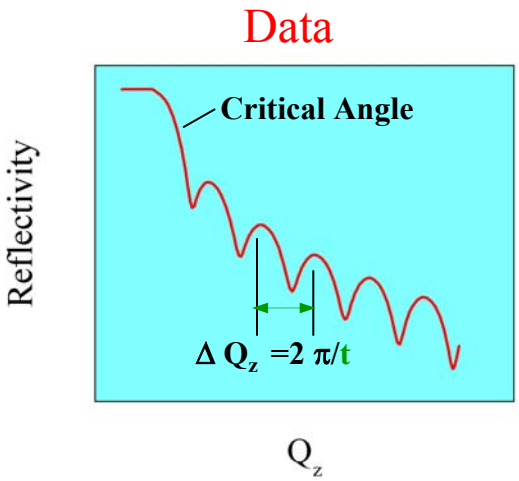
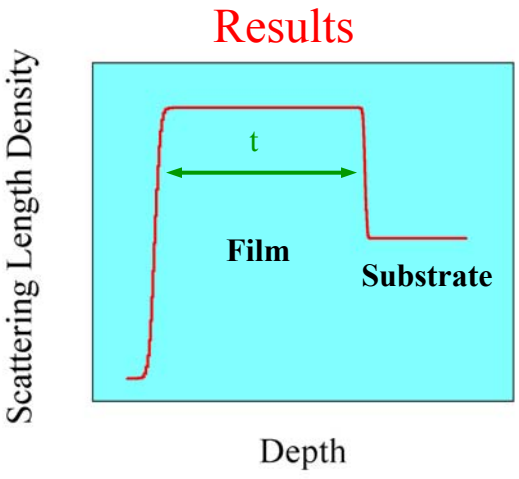
Measurement of Specular Reflectivity

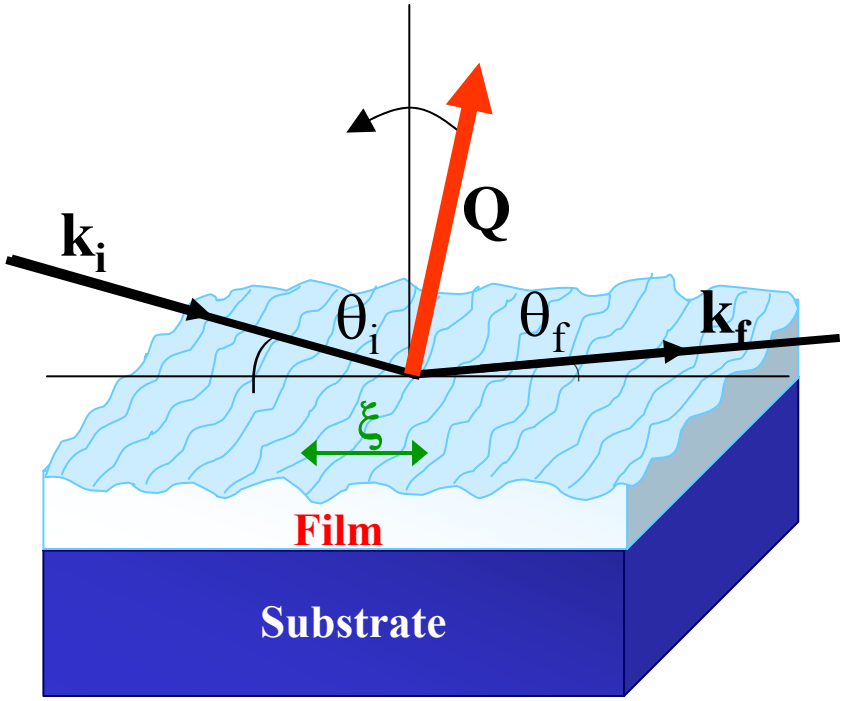


In specular reflectivity measurements, neutrons impinge upon the sample surface at an angle θ_i and are scattered at an angle θ_f. The incident and exit angles are equal ($\theta = \theta_i = \theta_f$) and incremented together. The wave vector Q_z is defined as $4 \pi \sin \theta / \lambda$, where λ is the neutron wavelength. Above the critical angle θ_c for total internal reflection, the data show finite-size fringes whose separation are inversely related to the film layer thickness. After subtraction of the off-specular background, these data can be fit (or inverted) to obtain a real-space profile of the scattering length density as a function of depth.





Measurement of Off-Specular Reflectivity



Measurement of the off-specular reflectivity provide information about the length scale of in-plane structural correlations. For transverse-Q_x scans (i.e., rocking curves), the scattering angle 2θ is held constant while θ_i and θ_f are varied equally in opposite directions ($\theta_i + \theta_f = const$). Typically a narrow specular peak, evident at Q_x=0, can be separated from the underlying diffuse scattering which is broad. The width of the diffuse peak is indirectly related to the inverse of the coherence length ξ of the in-plane roughness.